

WHAT IS CLAIMED IS:

A multi-component analyzing apparatus in which infrared light is irradiated to a measuring-subject sample which is constituted by either measuring-subject components whose sorts or quantities are limited or by a mixed article made of said measuring-subject components; intensity of infrared light having respective wavelength ranges which are fitted to infrared absorption spectra of the respective measuring-subject components among such infrared light penetrated through the measuring-subject sample is measured by employing a plurality of detectors corresponding thereto; and said multi-component analyzing apparatus includes a calculation processing unit for analyzing the infrared light intensity of the respective wavelength ranges so as to acquire concentration of the respective measuring-subject components; wherein the calculation processing unit is capable of executing an analyzing process program for executing analysis operations of the concentration of the respective measuring-subject components by solving simultaneous equations which are constituted by equations having mutual interference correction terms used to correct interference adverse influences occurred among the respective measuring-subject components.

2. A multi-component analyzing apparatus as claimed in claim 1, wherein said mutual interference correction term

includes a product made by multiplying a product of concentration of at least two measuring-subject components by one, or more mutual interference correction coefficients.

5           3.     A multi-component analyzing apparatus as claimed  
in claim 2, wherein said mutual interference correction  
coefficient is such a value obtained by dividing a difference  
by said product of the concentration of said two  
measuring-subject components, while said difference is  
10   calculated between a measurement value obtained by measuring  
a calibration-purpose sample formed by mixing two  
measuring-subject components with each other in a preselected  
ratio, and such a value obtained by substituting the  
concentration of said two measuring-subject components for such  
15   equations from which the mutual interference correction terms  
have been eliminated among said equations.

          4.     A multi-component analyzing apparatus as claimed  
in claim 1, wherein said equations are multi-dimensional  
20   equations; and

          said analyzing process program executes a stepwise  
calculation processing operation by which the concentration of  
the respective measuring-subject components is analyzed by  
employing simultaneous equations which are arranged by  
25   one-dimensional equations other than said multi-dimensional  
equations so as to calculate approximated values as to the

concentration of said respective measuring-subject components, and said multi-dimensional simultaneous equations are converged by employing said approximated values.

5           5.     A multi-component analyzing apparatus as claimed in claim 1, wherein said calculation processing unit owns a standard sample correction coefficient which corresponds to either a ratio or a difference between measurement values of the respective detectors obtained by that while either standard  
10   samples made of single measuring-subject components or standard samples formed by mixing a plurality of measuring-subject components in predetermined concentration is employed, the respective standard samples are measured, and calculation values obtained by substituting the concentration of said  
15   standard samples for said simultaneous equations, and said standard sample correction coefficient has been stored in relation to each of said standard samples in order to further correct said simultaneous equations; and also

          said analyzing process program executes the analyzing  
20   process operation in the case that while the concentration of the respective measuring-subject components acquired by said analyzing process operation is compared with the concentration of said standard sample, when the relevant standard sample is present, the standard sample correction coefficient related to  
25   said relevant standard sample is employed so as to execute said analyzing process operation.

6. A mixed-refrigerant analyzing apparatus  
comprising:

a cell to which a mixed refrigerant containing a plurality  
of refrigerant components is supplied as sample gas;

5 an infrared light source for irradiating infrared light  
to said cell;

a plurality of bandpass filters for penetrating  
therethrough infrared light having wavelengths which are fitted  
to infrared absorption spectra of said respective refrigerant  
10 components among infrared light which has penetrated said cell;

a plurality of detectors for measuring intensity of the  
infrared light which has penetrated the respective bandpass  
filters; and

calculation processing unit for analyzing the infrared  
15 light intensity of the respective wavelength ranges so as to  
acquire concentration of the respective measuring-subject  
components;

wherein the calculation processing unit is capable of  
executing an analyzing process program for executing analysis  
20 operations of the concentration of the respective  
measuring-subject components by solving simultaneous  
equations which are constituted by equations having mutual  
interference correction terms used to correct interference  
adverse influences occurred among the respective  
25 measuring-subject components.

7. A mixed-refrigerant analyzing apparatus  
comprising:

a cell to which a mixed refrigerant containing a plurality  
of refrigerant components is supplied as sample gas;

5 an infrared light source for irradiating infrared light  
to said cell;

a plurality of bandpass filters for penetrating  
therethrough infrared light having wavelengths which are fitted  
to infrared absorption spectra of said respective refrigerant  
10 components among infrared light which has penetrated said cell;  
and

a plurality of detectors for measuring intensity of the  
infrared light which has penetrated the respective bandpass  
filters;

15 wherein at least two bandpass filters are provided among  
such bandpass filters, the infrared transmission central wave  
numbers of which are set to 1222 to 1235  $\text{cm}^{-1}$ , 1205 to 1220  $\text{cm}^{-1}$ ,  
1180 to 1192  $\text{cm}^{-1}$ , 1065 to 1088  $\text{cm}^{-1}$ , 981 to 1000  $\text{cm}^{-1}$ , 908 to  
933  $\text{cm}^{-1}$  and 798 to 820  $\text{cm}^{-1}$ , respectively.

20 8. A mixed-refrigerant analyzing apparatus  
comprising:

a cell to which a mixed refrigerant containing a plurality  
of refrigerant components is supplied as sample gas;

25 an infrared light source for irradiating infrared light  
to said cell;

a plurality of bandpass filters for penetrating

therethrough infrared light having wavelengths which are fitted to infrared absorption spectra of said respective refrigerant components among infrared light which has penetrated said cell; and

5           a plurality of detectors for measuring intensity of the infrared light which has penetrated the respective bandpass filters;

          wherein at least two bandpass filters are provided among such bandpass filters, the infrared transmission central wave  
10   numbers of which are set to 1263 to 1269  $\text{cm}^{-1}$ , 1137 to 1151  $\text{cm}^{-1}$ , 1180 to 1192  $\text{cm}^{-1}$ , 1065 to 1088  $\text{cm}^{-1}$ , 981 to 1000  $\text{cm}^{-1}$ , 908 to 933  $\text{cm}^{-1}$ , and 798 to 820  $\text{cm}^{-1}$ , respectively.

9.       A mixed-refrigerant analyzing apparatus comprising:

15           a cell to which a mixed refrigerant containing a plurality of refrigerant components is supplied as sample gas;

          an infrared light source for irradiating infrared light to said cell;

          a plurality of bandpass filters for penetrating  
20   therethrough infrared light having wavelengths which are fitted to infrared absorption spectra of said respective refrigerant components among infrared light which has penetrated said cell; and

          a plurality of detectors for measuring intensity of the  
25   infrared light which has penetrated the respective bandpass filters;

wherein at least two bandpass filters are provided among such bandpass filters, the infrared transmission central wave numbers of which are set to 1222 to 1235  $\text{cm}^{-1}$ , 1137 to 1151  $\text{cm}^{-1}$ , 1180 to 1192  $\text{cm}^{-1}$ , 1065 to 1088  $\text{cm}^{-1}$ , 981 to 1000  $\text{cm}^{-1}$ , 908 to 5 933  $\text{cm}^{-1}$ , and 798 to 820  $\text{cm}^{-1}$ , respectively.

10. A mixed-refrigerant analyzing apparatus comprising:

a cell to which a mixed refrigerant containing a plurality of refrigerant components is supplied as sample gas;

10 an infrared light source for irradiating infrared light to said cell;

a plurality of bandpass filters for penetrating therethrough infrared light having wavelengths which are fitted to infrared absorption spectra of said respective refrigerant components among infrared light which has penetrated said cell; 15 and

a plurality of detectors for measuring intensity of the infrared light which has penetrated the respective bandpass filters;

20 wherein at least two bandpass filters are provided among such bandpass filters, the infrared transmission central wave numbers of which are set to 1263 to 1269  $\text{cm}^{-1}$ , 1205 to 1220  $\text{cm}^{-1}$ , 1180 to 1192  $\text{cm}^{-1}$ , 1065 to 1088  $\text{cm}^{-1}$ , 981 to 1000  $\text{cm}^{-1}$ , 908 to 933  $\text{cm}^{-1}$  and 798 to 820  $\text{cm}^{-1}$ , respectively.

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